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ALLOY.

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To all whom it may concern:

Be it known that I, HARRY ETCHELLS, of Limberlost, Twentywell Lane, Bradway, near Sheffield, in the county of Derby, England, a subject of the King of Great Britain and Ireland, have invented certain new and useful Improvements in or Relating to Alloys, of which the following is a specification.

Alloys comprising, as the principal elements or constituents, nickel, chromium, iron and carbon have heretofore been proposed, the respective proportions varying within wide limits. For instance, the proportion of nickel has varied from 0.5% to 80%, that of the chromium from 3% to 40%, that of the carbon from 0.2% to 1%, and that of the iron constituting the balance. All such alloys embodying nickel and carbon contents have had 0.30% as the minimum proportion of carbon with the nickel content of 25% and upwards, while in alloys containing a nickel content of 20% to 25% it has been proposed to have a carbon content varying from 0.20% to 0.50%.

Such alloys are prepared by melting the constituents together, or by reducing the oxides of the constituent metals by suitable agents.

The object of this invention is to provide an alloy, including the aforesaid principal elements or constituents, possessing exceptional properties in resisting the staining and corrosive action of the acids, alkalies and salts usually encountered in the preparation of food, in the machinery of general sanitation, and in many industrial processes, in which connection it is essential that the carbon content be kept as low as possible in order to increase the ductility and the stainlessness.

My invention is characterized in that I employ a minimum nickel content of 26%, with a maximum carbon content of 0.25% for that proportion and over it, together with the chromium and iron in various proportions.

The particular proportions of the principal elements or constituents of an alloy embodying my invention vary within certain limits depending upon the service of the articles made from it, such limits being as follows: nickel, 26% to 50%; chromium, 5% to 30%; iron, 25% to 69%; carbon, not exceeding 0.25%.

My invention is also applicable where cobalt is used either in substitution of, or in combination with, the nickel, so long as the cobalt alone, or the cobalt and nickel in combination, are used in the proportion of 26% to 50%. Cobalt has almost the same properties as nickel, the only objection being that it makes the alloy more expensive. Hence I denominate cobalt or a mixture of cobalt and nickel or nickel, a nickel-like metal.

It will be appreciated that the physical properties of the alloy will be somewhat modified by varying the proportions of the elements or constituents designated as impurities (hereinafter, for the sake of brevity, referred to in the appended claims, as "additions") whether the same be added or whether they occur as impurities, in regard to tensile strength, ductility and ease of working; but the alloy's resistance to corrosion will not be vitally impaired and it will still be capable of taking a fine polish and resisting staining by the usual agents, such as vinegar and other food acids.

In order to more particularly describe the characteristics and properties referred to, it may be mentioned that an alloy containing substantially: nickel, 30%; chromium, 11%; iron, 58%; carbon, 0.15%; manganese, 0.35%; silicon, 0.20%; sulphur, 0.02%; phosphorus, 0.02%; aluminium, trace—would give the following tensile properties in its forged condition, on ½" diameter section: yield point, 25 tons per square inch; maximum stress, 42.5 tons per square inch; elongation, 38% on a 2" length; reduction of area, 54.8; Brinell hardness, 156.

Such an alloy, or any other alloy made according to this invention, will be machinable and will roll in the hot or cold state. It will stamp satisfactorily by the usual methods of preparing such objects as spoons and forks, and may be drawn into wire by the usual processes. Further, it will have a pleasing colour and a silvery lustre rendering it particularly suitable for table and decorative ware.

Such an alloy will be practically non-corrosive in 5% strength of hydrochloric acid or sulphuric acid or nitric acid with water. It will not stain or tarnish when immersed in vinegar, or the water in which green food vegetables have been boiled, and is thus eminently suitable for the manufacture of cooking utensils and food-preserving utensils.

Such an alloy will show remarkable resistance to corrosion by sea water and atmospheric agents generally, and by reason of its remarkable physical characteristics may be used for many engineering purposes.

Apart from the cost of the constituent materials, the cost of preparing these alloys is such as to render them competitive with existing methods for the manufacture of cutlery and similar purposes, while the development of their properties without frequent and expensive heat treatment renders them economical in the process of manufacture.

Where the alloy is produced by a method of reduction of the oxides of the principal metals, any one metal or proportion thereof may be used with the remainder as oxides, or any of the metals may be used with the oxide of the remaining one, but where oxides are used any or all of the reducing agents, such as silicon, magnesium and aluminium, must be used.

Among the uses to which the alloy may be put are:—

(1) Manufacture of decorative articles in ships and railway coaches, for lamp reflectors, mountings on stove grates, and bright metal decorations generally, which are required to maintain their lustre.

(2) Manufacture of tableware, such as forks, spoons, waiters, sugar-bowls, flower-bowls, vases, ash-trays, etc.

(3) Manufacture of cooking utensils, milk cans and food transporting and preserving containers generally.

(4) Manufacture of valves and various mechanical parts exposed to sea water, dilute acids and diluted chemicals.

What I claim and desire to secure by Letters Patent is:—

1. An alloy having as the principal constituent, a nickel-like metal, chromium, iron and carbon, the proportions of the nickel-like metal being 30%; those of the chromium being 11%; those of the iron being 58% and those of the carbon being 0.15%; the balance being impurities.

2. An alloy having, as the principal constituents, a nickel-like metal, chromium, iron and carbon, the proportions of the nickel-like metal being 30 per cent, those of the chromium being 11 per cent, those of the iron being 58 per cent, and those of the carbon being 0.15 per cent, the balance being manganese, silicon, sulphur, phosphorus and aluminium.

3. An alloy having, as the principal constituents, nickel, chromium, iron and carbon, the proportions of the nickel being 30 per cent, those of the chromium being 11 per cent, those of the iron being 58 per cent, and those of the carbon being 0.15 per cent, the balance being manganese, silicon, sulphur, phosphorus and aluminium.

In testimony whereof, I affix my signature.

HARRY ETCHELLS.